



# UNITED STATES PATENT AND TRADEMARK OFFICE

UNITED STATES DEPARTMENT OF COMMERCE  
United States Patent and Trademark Office  
Address: COMMISSIONER FOR PATENTS  
P.O. Box 1450  
Alexandria, Virginia 22313-1450  
www.uspto.gov

APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/849,345	05/19/2004	Robert H. Burgener II	3398.2.9	6697
21552	7590	03/08/2006	EXAMINER	
MADSON & AUSTIN GATEWAY TOWER WEST SUITE 900 15 WEST SOUTH TEMPLE SALT LAKE CITY, UT 84101			TRAN, THIEN F	
			ART UNIT	PAPER NUMBER
			2811	

DATE MAILED: 03/08/2006

Please find below and/or attached an Office communication concerning this application or proceeding.

**Office Action Summary**

Application No.

10/849,345

Applicant(s)

BURGENER ET AL.

Examiner

Thien F. Tran

Art Unit

2811

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

**Period for Reply**

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

**Status**

- 1) ☒ Responsive to communication(s) filed on 05 December 2005.
- 2a) ☒ This action is **FINAL**. 2b) ☐ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

**Disposition of Claims**

- 4) ☒ Claim(s) 1-3,5-30,33-39 and 43-48 is/are pending in the application.
- 4a) Of the above claim(s) \_\_\_\_\_ is/are withdrawn from consideration.
- 5) ☒ Claim(s) 1-3,5-26 and 43-48 is/are allowed.
- 6) ☒ Claim(s) 27-30 and 33-39 is/are rejected.
- 7) ☐ Claim(s) \_\_\_\_\_ is/are objected to.
- 8) ☐ Claim(s) \_\_\_\_\_ are subject to restriction and/or election requirement.

**Application Papers**

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☐ The drawing(s) filed on \_\_\_\_\_ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.  
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).  
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

**Priority under 35 U.S.C. § 119**

- 12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All b) ☐ Some \* c) ☐ None of:
1. ☐ Certified copies of the priority documents have been received.
  2. ☐ Certified copies of the priority documents have been received in Application No. \_\_\_\_\_.
  3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

\* See the attached detailed Office action for a list of the certified copies not received.

**Attachment(s)**

- 1) ☒ Notice of References Cited (PTO-892)
- 2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
- 3) ☒ Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08)  
Paper No(s)/Mail Date 06/30/05, 10/05/05.
- 4) ☐ Interview Summary (PTO-413)  
Paper No(s)/Mail Date. \_\_\_\_\_.
- 5) ☐ Notice of Informal Patent Application (PTO-152)
- 6) ☐ Other: \_\_\_\_\_.

## DETAILED ACTION

### ***Claim Rejections - 35 USC § 103***

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

Claim 27-30, 33-35 and 39 are rejected under 35 U.S.C. 103(a) as being unpatentable over White et al. (US 6,291,085) in view of Yamamoto et al. (EP 1 215 310 A1).

White et al. discloses a persistent p-type zinc oxide semiconductor material that is doped with a p-type dopant selected from phosphorus, arsenic, antimony, copper, wherein the p-type dopant concentration is sufficient to inherently render the zinc oxide a p-type semiconductor in a single crystal form, wherein semiconductor resistivity is less about 0.5 ohm-cm, and wherein the carrier mobility is about 0.1 cm<sup>2</sup>/Vs to about 50 cm<sup>2</sup>/Vs. White et al. does not disclose the carrier mobility greater than 100 cm<sup>2</sup>/Vs. Yamamoto et al. discloses a p-type zinc oxide having the carrier mobility greater than 100 cm<sup>2</sup>/Vs at high temperature (see table 1). Therefore, it would have been obvious to a person having ordinary skill in the art at the time the invention was made to form the p-type zinc oxide material at high temperature (600°C) as taught by Yamamoto et al. in order to increase the carrier mobility of the material. Furthermore, it would have been obvious to one having ordinary skill in the art at the time the invention was made to form the p-type zinc oxide material having the carrier mobility as claimed, since it has been

held that where the general conditions of a claim are disclosed in the prior art, discovering the optimum or workable ranges involves only routine skill in the art. In re Aller, 105 USPQ 233.

Regarding claims 28-30, the resistivity is between about 1 ohm-cm and about  $10^{-4}$  ohm-cm that reads on the claimed range.

Regarding claims 33-35, the p-type dopant concentration is in the range from about  $10^{18}$  to  $10^{21}$  atoms/cm<sup>3</sup> that is in the claimed range.

Regarding claim 39, the zinc oxide is a non-stoichiometric zinc oxide compound.

Claim 36 is rejected under 35 U.S.C. 103(a) as being unpatentable over White et al. (US 6,291,085) in view of Yamamoto et al. (EP 1 215 310 A1) as applied to claims 27-30, 33-35 and 39 above, and further in view of Wasa et al. (US 3,766,041).

White et al. in view of Yamamoto et al. as described above do not disclose the self supporting substrate surface being amorphous. Wasa et al. discloses zinc oxide films formed on an amorphous substrate. It would have been obvious to a person having ordinary skill in the art at the time the invention was made to form the zinc oxide on an amorphous self supporting substrate surface as taught by Wasa et al. so that the orientation of the zinc oxide film can be well controlled.

Claims 37-38 are rejected under 35 U.S.C. 103(a) as being unpatentable over White et al. (US 6,291,085) in view of Yamamoto et al. (EP 1 215 310 A1) as applied to claims 27-30, 33-35 and 39 above, and further in view of Nause et al. (US 6,887,736).

White et al. in view of Yamamoto et al. as described above do not disclose the zinc oxide further comprising cadmium and magnesium to form magnesium cadmium

Art Unit: 2811

zinc oxide. Nause et al. recognized the need to improve the crystal quality of the film in White et al. (see col. 2, lines 30-36) by forming a magnesium cadmium and zinc oxide compound layer that has high crystal quality and also contains higher p-type dopant concentrations and possesses lower resistivity values. Therefore, it would have been obvious to form the zinc oxide layer of White et al. comprising cadmium and magnesium as taught by Nause et al. to improve the crystal quality of the ZnO film.

***Allowable Subject Matter***

Claims 1-3, 5-26 and 43-48 are allowed.

***Response to Arguments***

Applicant's arguments with respect to claims 27-30 and 33-39 have been considered but are moot in view of the new ground(s) of rejection.

***Conclusion***

Applicant's amendment necessitated the new ground(s) of rejection presented in this Office action. Accordingly, **THIS ACTION IS MADE FINAL**. See MPEP § 706.07(a). Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire **THREE MONTHS** from the mailing date of this action. In the event a first reply is filed within **TWO MONTHS** of the mailing date of this final action and the advisory action is not mailed until after the end of the **THREE-MONTH** shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of

Art Unit: 2811

the advisory action. In no event, however, will the statutory period for reply expire later than SIX MONTHS from the date of this final action.


Any inquiry concerning this communication or earlier communications from the examiner should be directed to Thien F. Tran whose telephone number is (571) 272-1665. The examiner can normally be reached on 8:30AM - 5:00PM Monday through Friday.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Eddie C. Lee can be reached on (571) 272-1732. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).

tt

March 01, 2006

  
**THIEN TRAN**  
**PRIMARY EXAMINER**